

## A Reconsideration of *Megalostoma* (Acanthaceae), a New Species, and Recognition of a New Section of *Justicia*

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Based on macromorphological and palynological evidence, *Megalostoma* (Acanthaceae) is reduced to sectional status within *Justicia*. Two previously described species, *J. tabascina* and *J. valvata*, and a newly described species, *J. dendropila*, show affinities to the only known species of *Megalostoma* and are also included in the section. A new combination in *Justicia* is proposed for *M. viridescens*.

Leonard (1940) described *Megalostoma* based on plants from Guatemala and noted that relatives of this unispecific genus were not known. Nevertheless, he placed the genus in "section" (undoubtedly a mistake for "tribe") *Louleridieae* because the "irregular coriaceous calyx and tubercular pollen grains suggest a possible relationship to *Louleridium* Wats." Other than noting its superficial similarities to *Louleridium*, remarking upon its "widely divergent corolla lobes," and providing a brief description, Leonard (1940) did not indicate other diagnostic features of *Megalostoma*.

*Louleridium* possesses a 3-parted calyx, four androecial elements (i.e., either four stamens or two stamens and two staminodes), and spheric-pantoporate pollen (Daniel 1995a, 1998; Richardson 1972; Scotland 1993; Scotland and Vollesen 2000), characteristics not found in the species described by Leonard. Scotland and Vollesen (2000) included *Louleridium* in tribe *Ruellieae* subtribe *Ruelliinae* whereas they treated *Megalostoma* in *Ruellieae* subtribe *Justiciinae*. Indeed, *Megalostoma* has a basically five-parted calyx (see below), a corolla with a rugula, two stamens, and a complex type of 3-aperturate pollen that indicate a relationship with *Justicia* of that subtribe.

Since the description of *M. viridescens*, a similar species from Mexico has been described as *Justicia valvata* (Daniel 1993). In addition, the Mexican genus *Tabascina* Baill. was shown to be indistinct from *Justicia* (Daniel 1990) and its sole species shares numerous characters with *J. valvata* (Daniel 1993). Based on the morphological similarities of *M. viridescens* to these two species of *Justicia*, *Megalostoma* is herewith reduced to synonymy within *Justicia*. Recent collections of a distinctive and undescribed species from the Yucatan Peninsula of Mexico reveal another relative of the previously described taxa in this alliance. The combination of several shared macromorphological and palynological features in these four species appears to be unique among American Acanthaceae and suggests taxonomic status at a suprageneric level. *Justicia* section *Megalostoma* is herewith recognized to accommodate these species.

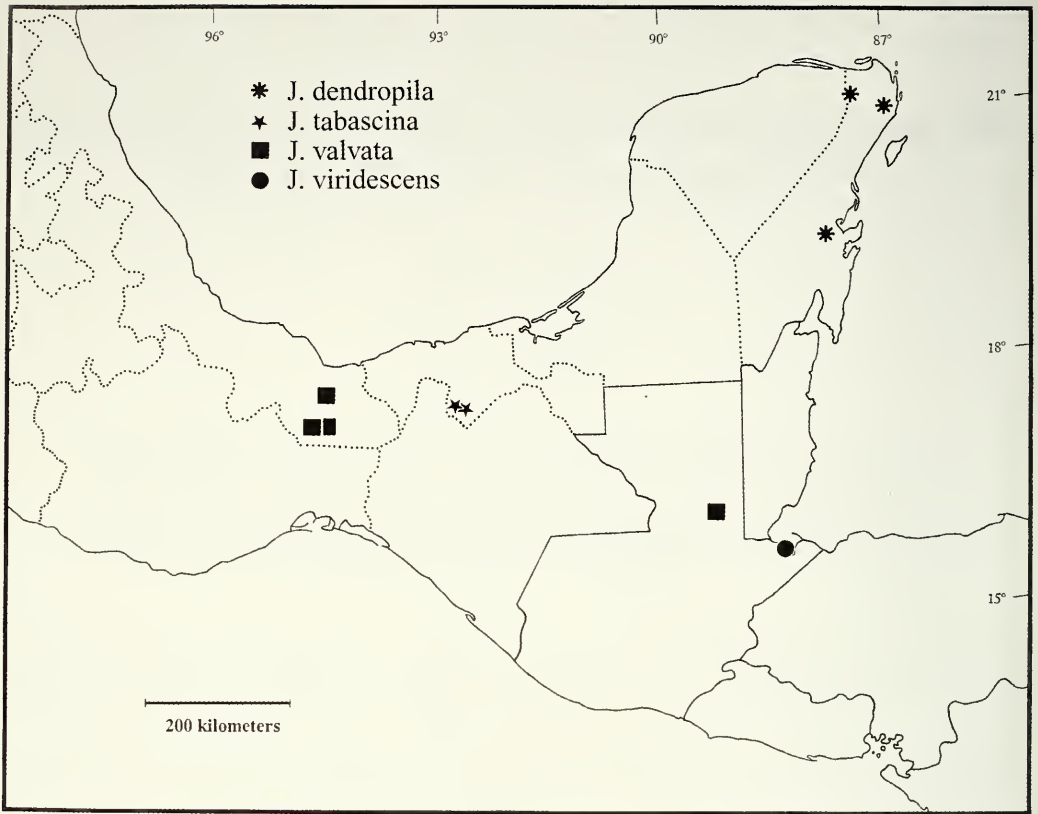


FIGURE 1. Map of southern Mexico and western Central America showing distributions of the species of *Justicia* sect. *Megalostoma*.

*Justicia* section *Megalostoma* (Leonard) T.F. Daniel, stat. nov. *Megalostoma* Leonard, J. Wash. Acad. Sci. 30:503, 1940.

**TYPE.** *Megalostoma viridescens* Leonard.

Shrubs or small trees. Inflorescence of dichasiate spikes (dichasia sessile) or thyrses (dichasia pedunculate). Bracts and bracteoles often caducous. Flowers subsessile to short pedicellate. Calyx with 5 valvate lobes, lobes separating distally in various ways (e.g., sometimes separating into 2 lobes and appearing somewhat spathe-like, sometimes 4-lobed with anterior lobes not separating, sometimes separating into 5 lobes), posterior lobe usually larger than others, lobes  $\pm$  coriaceous and relatively broad (2–7 mm wide). Corolla greenish or yellowish, externally pubescent with glandular trichomes, upper lip erect, internally rugulate, lower lip spreading  $\pm$  perpendicular to (or forming an obtuse angle with) upper lip, 3-lobed. Stamens with thecae subparallel to subsagittate, subequally to unequally inserted, pubescent or glabrous, lacking basal appendages; pollen euprolate to perprolate (polar diameter 1.8–2.7 times longer than equatorial diameter), 3–4-aperturate, apertures flanked on each side by 1 (–2) row(s) of insulae. Capsules (known from only two species) 4-seeded.

The section consists of four species from southern Mexico and Guatemala (Fig. 1). Three of the species occur in moist to wet forests whereas *J. dendropila* occurs in a dry forest formation.

Using Graham's (1988) infrageneric classification of *Justicia* (which was based on a subset of species), section *Megalostoma* cannot be readily identified with any of the suprageneric taxa recognized. These species share some affinities with her sects. *Plagiacanthus* (e.g., spicate inflorescence units, corollas less than 50 mm long, thecae with small or no appendages, and smooth seeds) and *Drejerella* (e.g., 3-aperturate pollen and smooth seeds). It differs from section *Plagiacanthus* by its greenish or yellowish corollas (vs. red or purplish) and 3–4-aperturate (vs. 2-aperturate) pollen, and from section *Drejerella* by its unappendaged thecae (vs. thecae with a basal appendage). Section *Megalostoma* differs from all other infrageneric taxa recognized by Graham (1988) by the combination of characters noted in the sectional description above. The relatively large, variously fused, and coriaceous calyx lobes and pollen varying from 3 to 4-aperturate (with the apertures usually flanked on each side by 1 row of insulae) appear to be especially distinctive features of the section. Following the key to species, abridged descriptions that incorporate new data are provided for those species that have been treated recently and a more detailed description is given for the newly described species, *J. dendropila*.

### Key to Species of *Justicia* Section *Megalostoma*

- 1a. Young stems, leaves, bracts, bracteoles, calyx lobes, and corolla pubescent with branched (dendritic) trichomes; pollen with interapertural surfaces tuberculate-echinate; plants of seasonally dry forests in the Yucatan Peninsula. . . . . 1. *J. dendropila*
- 1b. Young stems, leaves, bracts, bracteoles, calyx lobes, and corolla glabrous or pubescent with unbranched trichomes; pollen with interapertural surfaces coarsely reticulate; plants of moist to wet forests in southern Mexico (Veracruz and Tabasco) and Guatemala . . . . . 2
- 2a. Corolla 35–41 mm long; thecae 7–7.5 mm long; pollen 3-aperturate; style 37–39 mm long . . . . . 2. *J. viridescens*
- 2b. Corolla 18–25 mm long; thecae 4–5.3 mm long; pollen 4-aperturate; style 15–24 mm long . . . . . 3
- 3a. Young stems and rachises bifariously pubescent; dichasia solitary at inflorescence nodes, sessile; calyx externally glabrous . . . . . 3. *J. valvata*
- 3b. Young stems and rachises evenly pubescent; dichasia paired at inflorescence nodes, pedunculate; calyx externally pubescent . . . . . 4. *J. tabascina*

1. *Justicia dendropila* T.F. Daniel, sp. nov.

(Figure 2.)

**TYPE:** MEXICO: **Quintana Roo:** Mpio. Benito Juárez, 9 km W of Hwy. 307 in Puerto Morelos along road to Central Vallarta, 20°51.5'N, 86°59.1'W, 7 m, evergreen seasonal forest, 19 February 2003 (fl. & fr.), *T. Daniel 10287* (holotype: MEXU!; isotypes: BR!, CAS!, CICY!, CIQR!, ENCB!, F!, K!, MICH!, MO!, NY!, UCAM!, US!).

Frutices inclinati usque ad 4 m alti, pubescentes trichomatibus dendriticis. Folia petiolata, laminae anguste ellipticae vel ellipticae, 37–165 mm longae, 11–64 mm latae. Inflorescentia floribus in spicas terminales; dichasia alterna, sessilia, uniflora. Bracteae ellipticae vel subcirculares vel obovatae, 12–28 mm longae. Bracteolae lineares vel lanci-lineares, 12–18.5 mm longae. Calyx 5-lobus, 10–11 mm longus, lobis ovato-ellipticis vel ellipticis. Corolla viridi-flava, 37–48 mm longa. Stamina thecis 4.8–6 mm longis, subsagittatis vel subparallelis, basi ecalcaratis; pollinis granae 3-aperturatae. Capsula 11.5–15 mm longa, glabra.

Leaning shrubs to 4 m tall. Young stems subquadrate, densely and evenly pubescent with den-

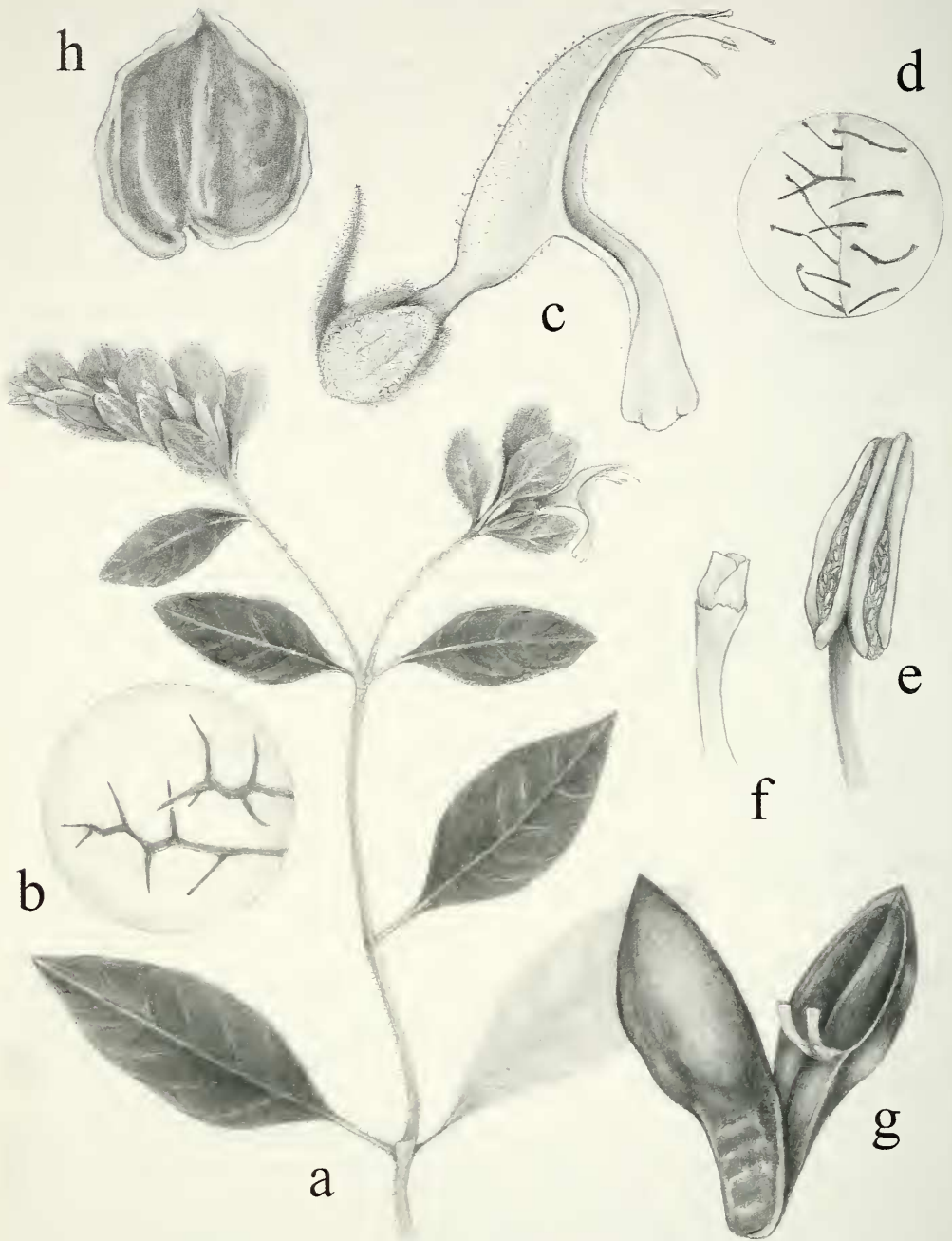


FIGURE 2. *Justicia dendropila* (Daniel 10287). a. Habit,  $\times 0.5$ . b. Dendritic trichomes,  $\times 33$ . c. One bracteole and flower,  $\times 1.8$ . d. Pubescence of corolla,  $\times 20$ . e. Anther,  $\times 6$ . f. Stigma,  $\times 17$ . g. Capsule,  $\times 3.8$ . h. Seed,  $\times 7$ . Drawn by Victoria Saxe.

dritic trichomes 0.2–0.5 mm long. Leaves petiolate, petioles to 20 mm long, blades narrowly elliptic to elliptic, 37–165 mm long, 11–64 mm wide, 1.9–4.8 times longer than wide, acute to subacuminate at apex, acute to attenuate at base, surfaces pubescent with dendritic trichomes, margin entire. Inflorescence of terminal dichasiate spikes, rachis pubescent like young stems; dichasia alternate, sessile, 1 (–2)-flowered. Bracts green with maroon near apex, elliptic to subcircular to obovate, 12–28 mm long, 6–18 mm wide (sometimes larger and subfoliose at base of spike), abaxial surface pubescent with cauline type trichomes. Bracteoles linear to lance-linear (to oblanceolate), 12–18.5 mm long, 1–3.4 mm wide, abaxial surface pubescent like bracts. Flowers sessile to subsessile (i.e., pedicels to 0.5 mm long). Calyx 10–11 mm long, 5-lobed, lobes ovate-elliptic to elliptic, 8–9 mm long, 3–4.4 mm wide, abaxially pubescent with cauline type trichomes, margin densely pubescent with intertwined flexuose dendritic trichomes to 1.7 mm long. Corolla greenish yellow, 37–48 mm long, externally pubescent with flexuose glandular trichomes 0.1–0.4 mm long and unbranched or stellate to dendritic eglandular trichomes to 0.7 mm long, tube 18–20 mm long, narrow proximal portion 8–10 mm long, 4 mm in diameter, abruptly expanded at apex into throat, throat 7–11 mm long, 6–11 mm in diameter near midpoint, upper lip 20–31 mm long, 2-lobed at apex, lobes 0.3 mm long, lower lip 17–25 mm long, lobes 3.4–5 mm long, 3–3.4 mm wide. Stamens inserted near midpoint of throat, 33–36 mm long, filaments greenish yellow, glabrous distally, thecae brownish (immature) turning greenish yellow when mature, 4.8–6 mm long, subsagittate to subparallel, subequally inserted, subequal (distal theca slightly longer), lacking basal appendages, pubescent with eglandular trichomes (these sometimes obscured or appearing absent following dehiscence); pollen (Fig. 3) 3-aperturate, apertures flanked on each side by 1 (–2) rows of insulae, exine tuberculate-echinate. Style 34–50 mm long, glabrous, stigma subcapitate, 0.5 mm long. Capsule 11.5–15 mm long, glabrous, stipe 4–5 mm long, head 7.5–10 mm long, obovoid to ellipsoid. Seeds 4, lenticular, 4.2–4.8 mm long, 3.2–3.6 mm wide, surfaces  $\pm$  smooth to rugose, lacking trichomes, margin entire and  $\pm$  swollen.

**PHENOLOGY.**— Flowering: January–February; fruiting: January–February.

**DISTRIBUTION AND HABITATS.**— Known only from the Yucatán Peninsula (Quintana Roo) of southeastern Mexico; evergreen seasonal forests; 7–15 m.

**PARATYPES.**— MEXICO: **Quintana Roo:** Mpio. Carrillo Puerto, 6–10 km NE de Felipe Carrillo Puerto sobre el camino a Vigía Chico, *E. Cabrera et al.* 16380 (CAS); Mpio. Benito Juárez, 15 km N de Puerto Morelos hacia Cancún, 1 km hacia la autopista Cancún–Mérida, 21°01'N, 86°52'W, *R. Durán et al.* 3079 (CICY); Mpio. Benito Juárez, 8 km W del entronque a Vallarta, partiedo de la carr. Cancún–Tulum, 20°52'N, 86°57.5'W, *I. Olmsted et al.* 342 (CICY, MEXU); Mpio. Lázaro Cárdenas, camino blanco de Kantunilkin, rumbo a San Isidro, 21°08'N, 87°32'W, *E. Ucan* 1994 (CICY).

This species is unusual among Mexican *Justicia* in its dendritic pubescence. *Justicia stellata* (Greenm.) T.F. Daniel, a species from Jalisco, is the only other Mexican species in the genus with branched (varying from stellate to dendritic) trichomes. Unlike *J. dendropila*, *J. stellata* has reddish purple corollas and 2-aperturate pollen (Daniel 2002). Indeed, *J. dendropila* shares all of the characteristics of section *Megalostoma*, and appears most similar to *J. viridescens*. Both species have relatively large corollas and 3-aperturate pollen (Fig. 3). They can be distinguished by the following couplet:

- 1a. Plants with dendritic trichomes  $\pm$  throughout; young stems evenly pubescent; leaves acute to subacuminate at apex; inflorescence a terminal spike; bracts and bracteoles persistent; calyx 10–11 mm long; thecae 4.8–6 mm long; pollen with exine echinate-tuberculate; plants of dry forests in Quintana Roo, Mexico ..... *J. dendropila*

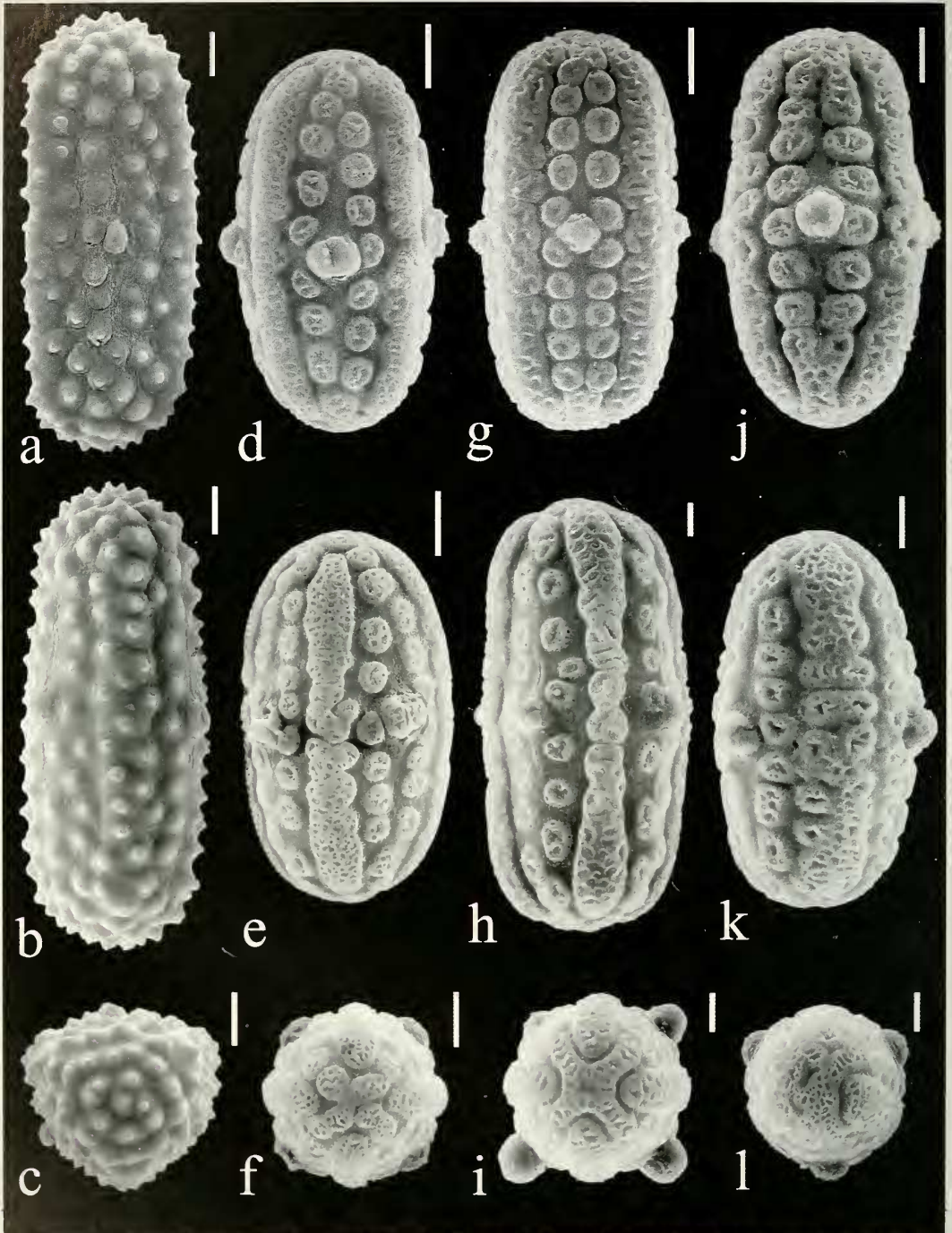


FIGURE 3. Pollen of *Justicia* section *Megalostoma*. a–c. *Justicia dendropila* (Daniel 10287), a = apertural view, b = interapertural view, c = polar view. d–f. *Justicia tabascina* (Cowan et al. 2860), d = apertural view, e = interapertural view, f = polar view. g–i. *Justicia valvata*, g = apertural view (Vázquez T. et al. V-2582), h = interapertural view (Contreras 9311), i = polar view (Vázquez T. et al. V-2582). j–l. *Justicia viridescens* (Martínez S. et al. 23668), j = apertural view, k = interapertural view, l = polar view. All scales = 10  $\mu$ m.

1b. Plants lacking dendritic trichomes; young stems bifariously pubescent; leaves long-acuminate to caudate at apex; inflorescence a terminal panicle; bracts and bracteoles caducous; calyx 12–19 mm long; thecae 7–7.5 mm long; pollen with exine coarsely reticulate; plants of wet forests in Izabal, Guatemala . . . . . *J. viridescens*

2. *Justicia viridescens* (Leonard) T.F. Daniel, comb. nov. *Megalostoma viridescens* Leonard, J. Wash. Acad. Sci. 30:503. 1940.

**TYPE:** GUATEMALA: **Izabal:** Escoba, across bay (W) from Puerto Barrios, near sea level, wet forest. 3 May 1939. *P. Standley 72948* (holotype: F!; isotype: US!).

Shrubs or small trees to 6 m tall. Young stems quadrate, bifariously pubescent with antrorse eglandular trichomes 0.05–0.1 mm long. Leaves subsessile to petiolate, petioles to 5 mm long, blades ovate-elliptic to elliptic, 55–125 mm long, 18–44 mm wide, 2.2–3.5 times longer than wide, long-acuminate to caudate at apex, rounded to acute at base, surfaces glabrous or nearly so, margin entire to subsinuate. Inflorescence of axillary and terminal pedunculate spikes, collectively forming a terminal panicle, rachises ± evenly pubescent with antrorse eglandular trichomes 0.05–0.2 mm long; dichasia 1-flowered, solitary at nodes (i.e., alternate), not appearing secund, sessile. Bracts subtending dichasia caducous, not seen. Bracteoles caducous, not seen. Flowers subsessile to short pedicellate, pedicels to 2 mm long. Calyx 12–19 mm long, abaxially glabrous or nearly so, lobes ± lunate (i.e., curved), 3–7 mm wide, margins sometimes inconspicuously ciliate. Corolla green to greenish white, 35–41 mm long, externally pubescent with erect to flexuose glandular trichomes 0.1–0.2 mm long, tube 14.5–17 mm long, upper lip 22–27 mm long, apex not seen, lower lip 19–22 mm long, lobes not seen. Stamens 24 mm long, thecae 7–7.5 mm long, glabrous; pollen (Fig. 3) 3-aperturate, exine coarsely reticulate. Style 37–39 mm long, stigma subhemispheric, equally 2-lobed, lobes 0.2 mm long. Capsule and seeds not seen.

**PHENOLOGY.**— Flowering: May, September; fruiting: unknown.

**DISTRIBUTION AND HABITATS.**— Known only from eastern Guatemala (Izabal); lowland rain forests; near sea level–120 m.

**ILLUSTRATION.**— J. Wash. Acad. Sci. 30: 502. 1940.

**ADDITIONAL SPECIMENS EXAMINED.**— GUATEMALA: **Izabal:** Mpio. Pto. Barrios, en el Río las Escobas, camino entre Pto. Barrios y Punta de Palma, *E. Martínez S. et al. 23668* (MEXU, MO); Escoba, across bay (W) from Puerto Barrios, *P. Standley 73025* (F).

*Megalostoma viridescens* was described from the type and two paratypes, all from the same locality in eastern Guatemala. *Martínez S. et al. 23668*, a recent (1988) collection from the vicinity of the type locality, allows this species to be more fully characterized and reveals that the species still persists in eastern Guatemala.

*Justicia viridescens* and *J. valvata* appear more similar to one another than either does to *J. tabascina*. They differ from the latter species by their bifarious cauline pubescence, sessile dichasia that are solitary at the inflorescence nodes, and abaxially glabrous calyces. Pollen of *J. viridescens* (based on *Martínez S. et al. 23668* and *Standley 73025*) differs from that of both *J. valvata* and *J. tabascina* by having only three apertures (Fig. 3).

3. *Justicia valvata* T.F. Daniel, Contr. Univ. Michigan Herb. 19:282. 1993.

**TYPE:** MEXICO: **Veracruz:** Mpio. Hidalgotitlán, KM 7 camino a la Escuadra, 140 m, selva alta perenifolia, 10 September 1974, *J. Dorantes et al. D-3538* (holotype: CAS!; isotypes: MEXU!, MO!).

Shrubs to small trees to 5 m tall. Young stems quadrate, bifariously pubescent with antrorse eglandular trichomes 0.2–0.4 mm long, soon glabrate. Leaves subsessile to petiolate, petioles to 16 mm long, blades elliptic, 35–240 mm long, 14–73 mm wide, 2.4–3.3 times longer than wide, intergrading with bracts, acuminate to subfalcate at apex, acute to attenuate at base, adaxial surface glabrous, abaxial surface glabrous or with scattered eglandular trichomes at junctions of major veins. Inflorescence of axillary and terminal pedunculate spikes, collectively forming a terminal panicle, rachis pubescent like young stems: dichasia 1-flowered, solitary at nodes (i.e., alternate), secund, sessile. Bracts subfoliose, caducous, lance-elliptic to lance-linear, 3.5–12 mm long, 0.7–3 mm wide, glabrous or sparsely pubescent with antrorse-appressed eglandular trichomes. Bracteoles caducous, lance-linear, 2.5–3 mm long, 0.5–0.6 mm wide, pubescent like bracts. Flowers subsessile (i.e., borne on pedicels to 1 mm long). Calyx 8–11.5 mm long, abaxially glabrous, lobes ovate-triangular, 2–3.5 mm wide. Corolla greenish-yellow with purplish markings, 18–25 mm long, externally pubescent with glandular trichomes 0.2–0.3 mm long, tube 9–14 mm long, upper lip 8–12 mm long, emarginate at apex, lower lip 7–9 mm long, lobes 1–2 mm long, 1.5–2 mm wide. Stamens 11–13 mm long, thecae 4–5 mm long, glabrous; pollen (Fig. 3) 4-aperturate, exine coarsely reticulate. Style 18–24 mm long, stigma 0.2 mm long, subcapitate to minutely 2-lobed. Capsule and seeds not seen.

**PHENOLOGY.**— Flowering: September–December; fruiting: unknown.

**DISTRIBUTION.**— Southern Mexico (Veracruz) and northern Guatemala (Petén); lowland rain forests; 100–150 meters.

**ILLUSTRATION.**— Contr. Univ. Michigan Herb. 19: 284. 1993.

**ADDITIONAL SPECIMENS EXAMINED.**— GUATEMALA: **Petén:** Los Arcos, Cadenas Road, on km 143, west, *E. Contreras 9311* (F, K, LL, MO, PH, S). MEXICO: **Veracruz:** Mpio. Hidalgotitlán, Benito Juárez segundo, 17°47'N, 94°39'W, *G. Castillo C. 364* (F, IEB, MEXU); Mpio. Hidalgotitlán, 7 km NW del Campamento Hermanos Cedillo por la brecha a La Escuadra, 17°16'N, 94°36'W, *M. Vázquez et al. V-1752* (F); Mpio. Jesús Carranza, 2 km N de Poblado 2, Ejido F. J. Mina, 17°16'N, 94°40'W, *M. Vázquez T. et al. V-2582* (CAS, MEXU).

Pollen of this species (based on *Contreras 9311*, *Dorantes et al. D-3538*, and *Vázquez T. et al. V-2582*) is 4-aperturate and thus appears more similar to that of *J. tabascina* than to that of either *J. viridescens* or *J. dendropila* (Fig. 3). Variation in pollen of this species was discussed by Daniel (1993). Four-aperturate pollen in *Justicia* was unknown to Graham (1988), but has been noted to occur in at least nine Mexican species (including *J. tabascina* and *J. valvata*) of the genus (Daniel 1995b, 1995c, 1998; Wasshausen and Daniel 1995). Pollen of the other seven species (i.e., *J. angustiflora* D.N. Gibson, *J. jitotolana* T.F. Daniel, *J. masiaca* T.F. Daniel, *J. multicanlis* Donn. Sm., *J. nelsonii* (Greenm.) T.F. Daniel, *J. nevlingii* Wassh. & T.F. Daniel, and *J. warnockii* B.L. Turner) with 4-aperturate pollen differs from that of section *Megalostoma* in various characteristics and these species do not appear to be closely related to *J. tabascina* and *J. valvata* based on macromorphological characteristics.

4. *Justicia tabascina* T.F. Daniel, Proc. Calif. Acad. Sci. 46:284. 1990. *Tabascina lindenii* Baill., Hist. Pl. 10: 445. 1891, as "*lindenii*," non *Justicia lindenii* Houlet (1870).

**TYPE:** MEXICO: **Tabasco:** forêts de Teapa, October, *J. Linden s.n.* (holotype: P!).

Shrubs to 2.5 m tall. Young stems subquadrate to quadrate, evenly pubescent with antrorse eglandular trichomes 0.3–0.6 mm long, internodes often constricted just above nodes. Leaves petiolate, petioles to 33 mm long, blades ovate-elliptic to elliptic, 36–180 mm long, 12–83 mm wide,



2–3 times longer than wide, acuminate at apex, acute to subattenuate at base, surfaces pubescent with cauline type trichomes mostly or entirely restricted to major veins. Inflorescence of 1–4 terminal thyrse(s) to 7.5 cm long, rachis evenly pubescent with flexuose to antrorse eglandular trichomes to 0.6 mm long; dichasia 1-flowered, paired at nodes (i.e., opposite), pedunculate, peduncles to 12 mm long, pubescent like rachis. Bracts often caducous, linear, 4–7 mm long, 0.6–1.5 mm wide, pubescent like rachis. Bracteoles linear, 2.5–6 mm long, 0.8–1 mm wide, pubescent like rachis. Flowers sessile to short (to 1 mm) pedicellate. Calyx 10–16 mm long, abaxially pubescent with erect to flexuose eglandular trichomes to 0.5 mm long, lobes asymmetrically elliptic to lance-elliptic to ovate-elliptic to elliptic, 2–5 mm wide. Corolla yellow or greenish white, 20–24 mm long, externally pubescent with glandular trichomes 0.05–0.2 mm long, tube 12–13 mm long, upper lip 9–11 mm long, entire at apex, lower lip 7–10 mm long, lobes 1.5–3 mm long, 1.5–2.5 mm wide. Stamens 9 mm long, thecae 3.8–5.3 mm long, dorsally pubescent with eglandular trichomes; pollen (Fig. 3) 4-aperturate, exine coarsely reticulate. Style 15–18 mm long, stigma more or less capitate, 0.2 mm long. Capsule 17–22 mm long, glabrous, stipe 7–9 mm long, head 10–13 mm long. Seeds 4, lenticular, subcircular in outline, 4.2–5 mm long, 3.5–4.8 mm wide, surfaces smooth.

**PHENOLOGY.**— Flowering: March, June, October; fruiting: February–March, June.

**DISTRIBUTION.**— Southern Mexico (Tabasco); lowland rain forests, lower montane rain forests: 20–140 m.

**ILLUSTRATION.**— None found.

**ADDITIONAL SPECIMENS EXAMINED.**— MEXICO: **Tabasco:** Mpio. Tacotalpa, Cerro de Madrigal, 7 km de las Est. Tacotalpa hacia Tapijulapa, *C. Cowan et al.* 2860 (CAS, MEXU); Mpio. Teapa, Grutas de Joconá, 3 km NE de Teapa, *E. Martínez S. et al.* 3098 (CAS, MEXU); Mpio. Teapa, Alrededores de las Grutas de Coconá, 17°33'N, 92°55'W, *P. Tenorio L. & M. Sousa S.* 19545 (EAP, MEXU); Mpio. Teapa, Cerro del Coconá, *S. Zamudio R.* 349 (MEXU).

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